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ARLIS II: New Arctic Drift Station

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Hillock of glacial rock on floating ice-island ARLIS-II
(Photo by Alaska Photo, Fairbanks)

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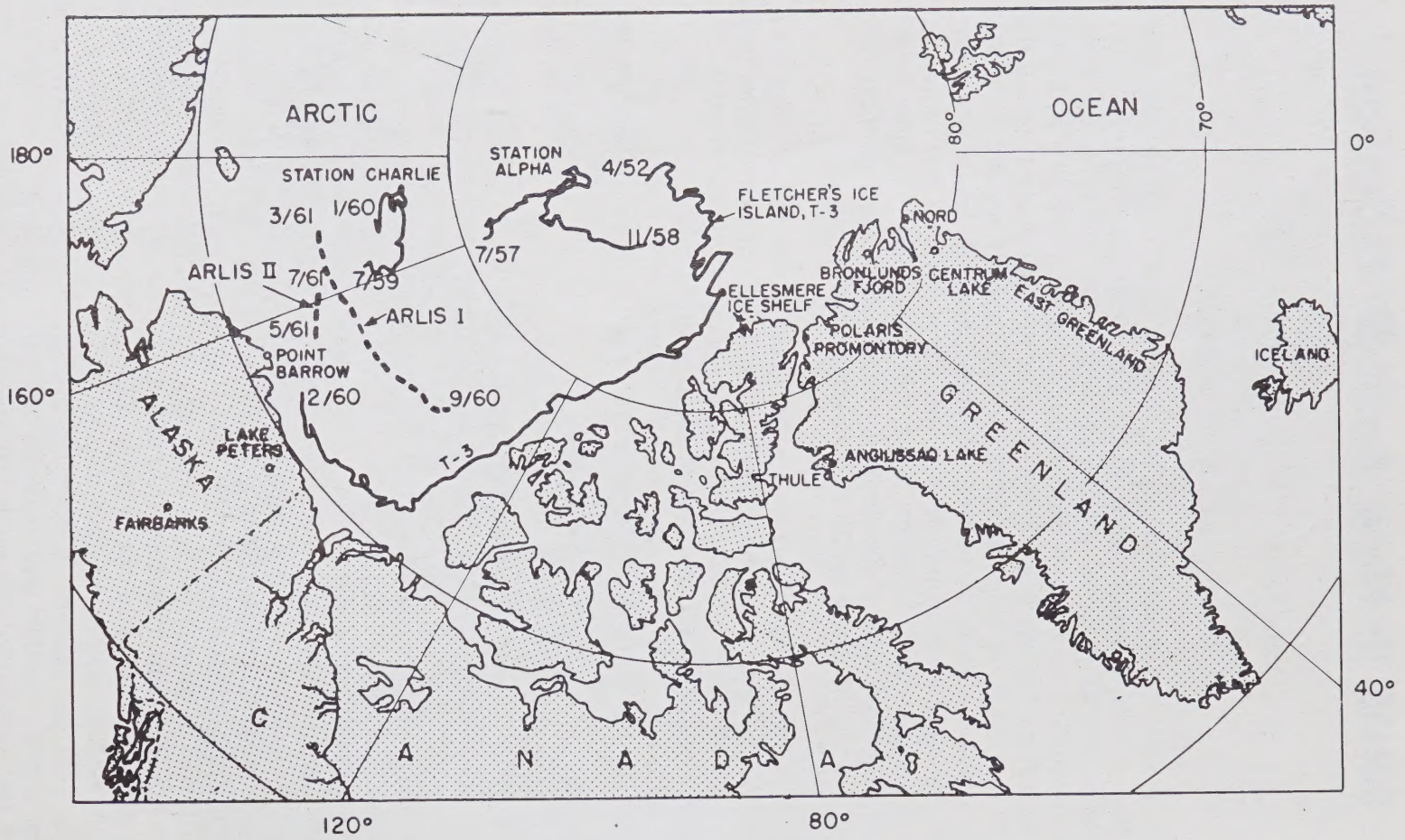
There are no land islands in the central Arctic Ocean. Many flights over this ocean attest to this fact. Yet Admiral Robert E. Peary, on his famous sledge trip in 1906 toward the pole, wrote in his notes that he saw enroute, "snow-clad mountains of a distant land." And Frederic Cook, in 1908, during his sledge trip in the same area, noted that between 87°and 88°N he crossed over old ice that did not have the characteristic pressure lines or hummocks of sea ice. He could not determine whether he was on land ice or sea ice. The Soviets, too, noted islands in the Beaufort and Lincoln Seas, and in 1931 "Takpuk Island" in the Beaufort Sea was "discovered," examined, and photographed by Eskimos. None of these lands has ever been seen again.

These reports have puzzled polar scientists for a long time, for certainly these men must have seen something. It is true that mirages are possible in these regions and images of mountains can often be seen for many miles beyond the line of sight owing to the refraction of light in the cold air. Is this the whole answer? Probably not. A more complete answer to these "discoveries" may now be at hand.

ICE ISLAND ARLIS II

ARLIS II (Arctic Laboratory Ice Station II), a massive island of thick, fresh-water (glacial) ice covered in many places with large piles of glacial debris, was recently discovered (or perhaps rediscovered) drifting with the surrounding pack ice about 130 statute miles north of Pt. Barrow, Alaska. This 3.5 by 1.5 mile ice island with its piles of rocks and boulders looks, even to the most discerning observer, remarkably like a snow-covered land mass. Its gently rolling topography, similar to a snow-covered meadow, differs markedly from the surrounding characteristic pack ice, whose perfectly flat surfaces alternate with thin, jumbled, blocky, broken ice. From "dunes" of glacial debris, the ARLIS II ice slopes gently, like a seashore, until it reaches the pack ice "ocean." This results in broad expanses of "beach" which are seen along many parts of the island. Elsewhere on the island is a more rugged coastline where blocks of sea ice are either pushed up on the shore or butt up against it, forming pressure ridges. At still another point, a river, muddy with glacial silt and pebbles, cascades off the edge of the island to the pack. It was frozen, snap-shot still, in late May, although during the summer melt season it is a torrent. The piles of glacial debris, ranging from large boulders to fine silt, probably represent a terminal morraine that was originally deposited on some ice shelf in the Canadian North. These rock piles look very much like mountains, owing to the faulty depth perception and lack of perspective which so commonly afflict observers in polar areas.

Early explorers might well have been deceived into believing such an ice island was a true land mass. It is now suspected that Peary,



Routes taken by the five drifting U. S. manned ice stations with the dates of the routes. T-3 and ARLIS-II are true ice islands of thick, fresh-water (glacial) ice. The others were thinner, ice-floe ice and have since been abandoned.

Cook, and others actually did see ice islands on their expeditions. Furthermore, it is not inconceivable that ARLIS II was among them. The drift pattern of ice in the Arctic Ocean could easily explain why an ice island seen at one point could be a thousand miles away some years later. The thickness of ARLIS II, about 80 feet, makes it quite durable and it could have been adrift for a century.

THE DISCOVERY

The Navy's Arctic Research Laboratory at Barrow, Alaska, in support of its continuing Arctic Ocean research program, had made all the final preparations for setting up its second Arctic Ocean drift station by airlift. Several reconnaissance flights had been made over the pack ice north of Pt. Barrow during May 1961, and a tentative area had been chosen for the site of a scientific station. This station was to be built on an ice floe in the same fashion as its predecessor, ARLIS I (see NavResRev, December 1960, pp. 1-4). On 23 May, the Laboratory's airlift team was ready. The Lab's two Cessna 180's and a new R4D, loaded down with enough equipment to set up a preliminary station, took off from the Barrow air strip. The R4D carried all the sections for two prefabricated buildings, a Coleman stove, ample supplies of fuel oil, a 110-V generator, radio equipment including a homer beacon, and enough rations for several weeks.

Enroute to the selected area, Max Brewer, Director of the Arctic Research Laboratory and Robert Fischer, the Lab's chief pilot, flying in one of the Cessna 180's, suddenly saw anamolous dark patches on the ice below. While the other two planes began circling, Fischer flew down to take a closer look. After they had circled many times over the area, it became apparent that the dark patches were piles of rocks and boulders. Years of experience in arctic flying enabled these men to ascertain from the slight differences in ice surfaces and in ice elevation, that this area was, in fact, an ice island.

This discovery is of major significance to the Arctic Ocean research effort. An ice island, as differentiated from ice floes or pack ice, has permanence. Since ice islands have broken off from thick shelf ice, presumably near Ellsmere Island in the Canadian Archipelago, they have considerable thickness compared with floe ice. After having broken off from a shelf area, the island gets caught in the constantly moving, melting, refreezing and breaking pack ice, and yet is thick and strong enough to remain intact. Thus, if a research station is to be set up on ice, it is much better to have an island which is essentially permanent, than a floe which is liable to break up. Ice islands, however, are scarce; only a few of them have been seen during arctic flights in the past fifteen years. The Air Force's "T-3" (Fletcher's Ice Island) is the only other such island which has been utilized by the United States for a research station, and it is now aground off Pt. Barrow, virtually abandoned.

Mr. Brewer, well aware of the value of this discovery, decided to alter the original plan and attempt to set up a station on the island. Realizing that the planes were rapidly using up their fuel in just circling over the area, Fischer made three trial landings, two on the island and one on the adjacent pack ice. While on the island, Fischer

chose a suitable area for the R4D to land, and within a few minutes the heavily laden plane came in, followed by the other Cessna 180. Two buildings were quickly erected, a generator set up, and the radio set and homer beacon connected. With a base established, the R4D returned to Barrow to start the airlift. In the 22 days required to complete the station, 146,100 pounds of equipment and materials were airlifted to ARLIS II, in a total of 28 flights by the R4D and 41 flights by the Cessna 180's. The complete station consists of fourteen 12 by 16-foot prefabricated buildings which house all the scientific equipment, and sleeping and messing facilities for personnel. In the summer group there are eleven scientists, and four ARL employees who do the cooking and maintenance.

RESEARCH ABOARD ARLIS II

One may speculate about the origin and the destiny of these islands, but the fact remains that, to date, they offer the only stable platforms from which an Arctic Ocean environmental research program may be conducted.

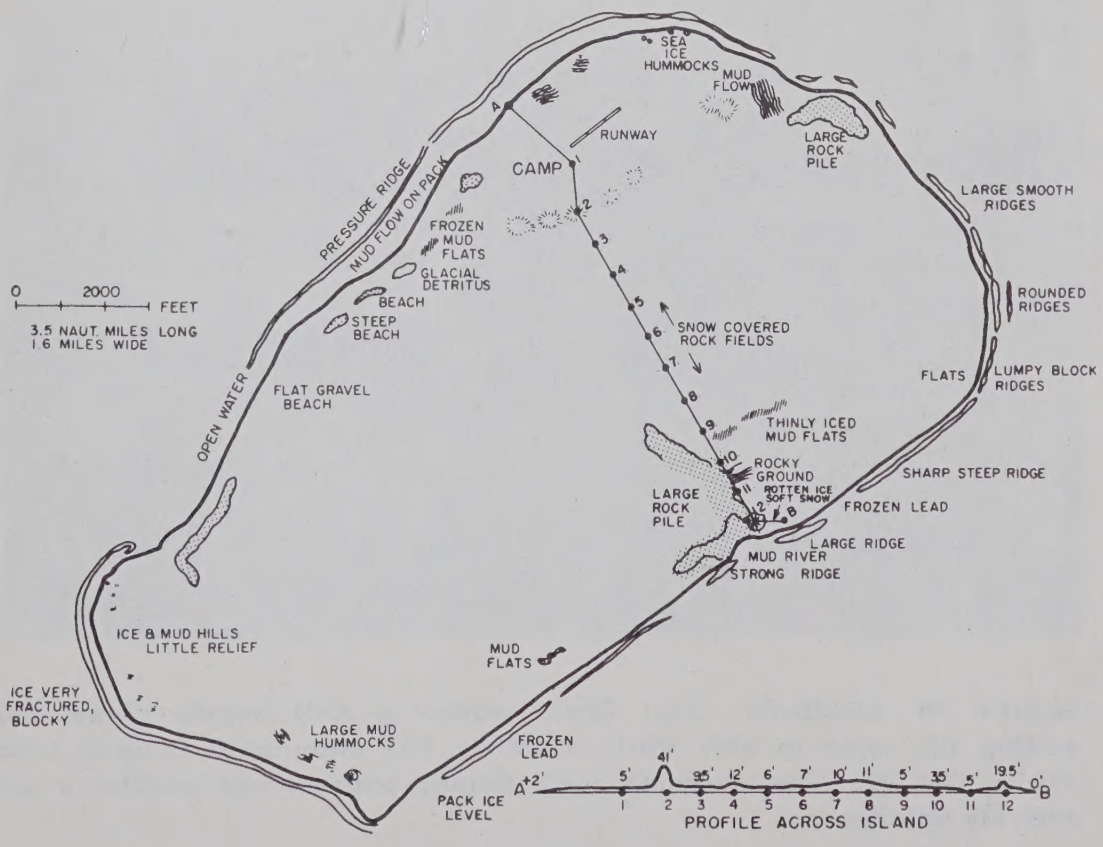
The Arctic Research Laboratory has developed the capability for setting up and supplying this type of research station by aircraft. The research programs are equipped and manned by various universities under contract with the Office of Naval Research and by other government agencies from time to time. Within the capabilities of the Laboratory, a camp is designed to accommodate the individual programs. The buildings, although all the same size, are configured differently inside as to desk, laboratory and special sleeping space, machinery, and the like, since each research study has its own special requirements.

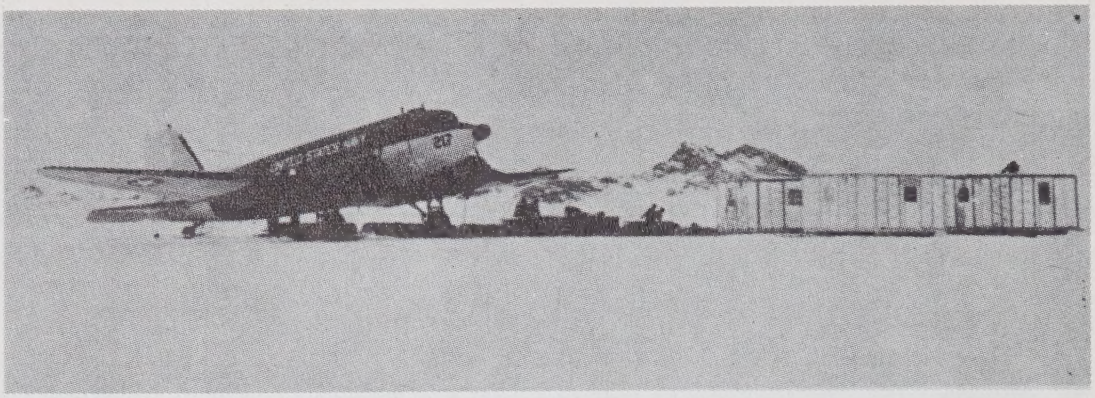
ARLIS II PROGRAMS

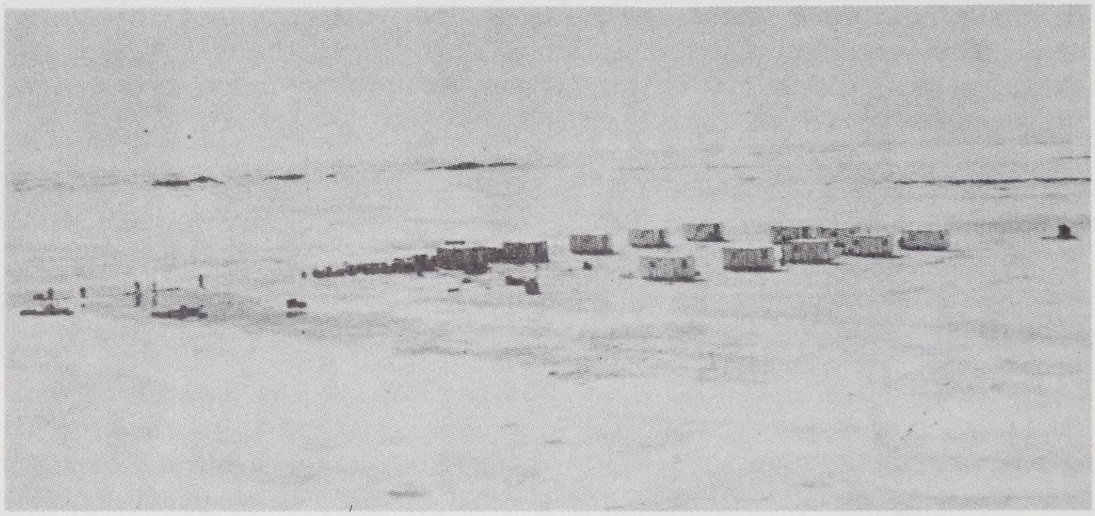
During the summer of 1961, the following research programs will be in progress:

1. Underwater Acoustic Studies	
Henry Kutschale	Lamont Geological Observatory
2. Marine Biology	
Donald Robinson	University of Southern California
3. Oceanography	
John Cooper	University of Washington
John Linhart	Arctic Research Laboratory
4. Geology of the Ice Island	
Dr. David Smith	Louisiana State University
Lynn Schraeder	Arctic Research Laboratory
5. Geophysics	
Stephen DenHartog	University of Wisconsin
6. Gravity - Microbarograph	
William McComas	U. S. Navy Hydrographic Office
7. Sea Ice Micrometeorology	
Arnold Hanson	University of Washington
Charles Cooke	Arctic Research Laboratory
8. Strain Measurement on Pack Ice	
Thomas Garrett, AG-1, USN	U. S. Navy Hydrographic Office
William McComas	U. S. Navy Hydrographic Office

Above: Aerial oblique of ice island ARLIS-II taken in May 1961 from 5000 feet. Glacial debris dot the island. Below: Map of ARLIS-II drawn by the author.







Scenes on ARLIS-II. Top: Crew unloading R4D supply plane and setting up camp in May 1961. Center: The completed camp in June 1961. Bottom: The summer melt season poses some problems not entirely unforeseen.

The ARLIS-II Support Group is composed of the following men from the Arctic Research Laboratory: John Beck, station leader; Carl Johnston, cook-baker; Frank Akpik, Mechanic; and Charles Edwardson, Jr., maintenance.

The station leader, John Beck, is directly responsible to the Director of ARL for the operation and safety of the ARLIS camp. Beck, a retired Navy Chief, has had much polar experience and is well suited for this work.

The summer group will remain on ARLIS II until later in September or early October when the ice strengthens sufficiently to allow safe aircraft landings. When they are taken off the ice island, others will continue their work; some programs will be added and others discontinued. It is expected that the station will be maintained on a year-round basis, and as the island drifts farther and farther north, new and unexplored ocean will be traversed and studied.

The drift-station concept has been developed to enable investigations of a continuous nature over this ice-covered ocean. Immediate drawbacks to this type of operation can be seen. Work space is limited, frequency and voltage of camp power fluctuates, plumbing is virtually nonexistent, and good shop facilities are not available. These drawbacks automatically limit the extent and sophistication of many projects, while others are eliminated completely. An obvious solution to these problems is to freeze a research ship, complete with labs, shops, storage spaces and all the convenience of shipboard living, into the pack-ice and allow it to drift through the Arctic Ocean. This idea is not new. Nansen froze his ship, the "FRAM," into this ice over sixty years ago. The ship drifted for three years with men aboard conducting research. Other examples could be cited.

Now, as a result of the drift-station experiences, the advantages of an ice-strengthened ship, frozen into the pack, become increasingly obvious. This, then, is the next step, although when it will occur is not certain. The Bureau of Ships, however, is now carrying out a study to ascertain the requirements that such a vessel would need in order to fulfill its mission. Until these plans become a reality, all the continuous programs in the Arctic Ocean will be carried out from drift stations similar to ARLIS II.
